Appendix A: Agenda

Region/ORD Workshop on Aquatic Life Criteria
Hilton Hotel, 1301 Sixth Avenue, Seattle, WA
December 4-7, 2001

December 4 - *MORNING*

8:00-8:30 Registration
8:30-9:00 Welcome - Janis Hastings, Region 10 and William Farland, Office of Research and Development

PLENARY SESSION
OVERVIEW OF AQUATIC LIFE CRITERIA
Co-chairs: Bob Spehar, ORD/NHEERL and Patricia Cirone, Region 10
Brief overviews of the current science approach(es), scientific application by the states and regions, and program office guidance.

9:00-9:30 Toxic Chemicals
Programmatic Overview of Science: Charlie Delos, OW/OST
Regional/State Problems: Debra Denton, Region 9

9:30-10:15 Habitat
Programmatic Overview of Science: Doug Norton, OW/OWOW
Regional/State Problems: Steve Bauer, Pocket Water, Inc. Idaho
ORD Approach: Jim Power, ORD/NHEERL

10:15-10:30 BREAK

10:30-11:00 Sediments
Programmatic Overview of Science: Susan Jackson, OW/OST
ORD Approach: Christopher Nietch, ORD/NRMRL

11:00-11:30 Nutrients
Programmatic Overview of Science: George Gibson, OW/OST
Region/State Problems: Danielle Tillman, Region 5

11:30-12:00 Biocriteria
Programmatic Overview of Science: Susan Jackson, OW/OST
Regional/State Problems: Gretchen Hayslip, Region 10
12:00-1:00 LUNCH

December 4 - *AFTERNOON* 1:00 - 4:45 PM

BIOCRITERIA and NUTRIENTS SESSION

Co-chairs: Gary Welker, Region 7 and Susan Cormier, ORD/NERL

All Workshop participants will hear presentations that will introduce the topics to be discussed in more detail during the breakout sessions to be held Wednesday, December 5.

1:00-1:30 Establishment of multi-use reference sites for biological and nutrient criteria development
Don Huggins, Univ. of Kansas (Visiting Scholar, Univ. of California - Davis)

1:30-2:00 Use of random selection in the determination of reference sites and the utility of probability based reference sites for EPA Regions
Phil Larsen, ORD/NHEERL

2:00-2:30 Establishing and use of reference sites and conditions in the State of Ohio
Chris Yoder, Midwest Biodiversity Institute, Columbus, OH

2:30-2:45 BREAK

2:45-3:15 Use of reference sites and conditions in the development of nutrient criteria
George Gibson, OW/OST

3:15-3:45 Nutrients - John Hutchens, ORD/NERL

3:45-4:15 Nutrients - Emile (Skeet) Lores, ORD/NHEERL

4:15-4:45 Aquatic Life Use (ALUS) concept of reference sites
Susan Jackson, OW/OST

December 5 - *ALL DAY* 8:30 AM - 5:00 PM

(BIOCRITERIA and NUTRIENTS CONTINUED)
CONCURRENT BREAKOUT SESSIONS

Breakout Session I: Multi-Use Reference Sites	Breakout Session II: Charting a Statistical Course for Navigating the Murky Waters of Bioindicator Development	Breakout Session III: Aquatic Life Use Support (ALUS)
Co-chairs: Don Huggins, U of CA-Davis Gary Welker, Region 7 George Gibson, OW/OST	Co-chairs: Susan Cormier, ORD/NERL Dave Pfeifer, Region 5	Panel: Susan Jackson, OW/OST Sue Norton, ORD/NCEA Gretchen Hayslip, Region 10 Susan Davies, State of Maine

4:00 - 5:00 WRAP-UP BIOCRITERIA SESSION

5:00 PM to 7:00 PM Poster Session: Presentations and Model Demonstrations

December 6 - *MORNING* 8:30 AM - 12:15 PM

TOXIC CHEMICALS SESSION

Co-chairs: Rick Bennett, ORD/NHEERL and Lisa Macchio, Region 10

8:30 - 9:15 Risk-Based Criteria
Russ Erickson, ORD/NHEERL

9:15 - 10:30 Discussion of Proposed Guidelines Revisions
Discussion of Proposed Guidelines Revisions: Charles Delos, OW/OST

10:30 - 10:45 BREAK

10:45 - 11:30 Emerging ESA issues
ESA consultation on Toxic Criteria: Kellie Kubena, Region 10
*Data quality, new information, and interagency research coordination***:**
Chris Tatara and Tracy Collier, NMFS
Considerations regarding tissue based criteria approaches for selenium and mercury
Steven Schwarzbach, USFWS

11:30 - 12:15 Interspecies Extrapolation of Toxicity Information
Endangered Fish Sensitivity to Chemicals and Interspecies Correlations for Acute Toxicity: Foster "Sonny" Mayer, ORD/NHEERL

12:15 - 1:15 LUNCH

December 6 - *AFTERNOON* 1:15 - 4:30 PM

TOXIC CHEMICALS SESSION (CONTINUED)

1:15 - 2:45 Inorganic Chemicals
The Biotic Ligand Model: Charles Delos, OW/OST
Dietary Metals Exposure: Russ Erickson, ORD/NHEERL

2:45 - 3:00 BREAK

3:00 - 4:30 Sediment toxicity
Overview of issues: Dave Mount, ORD/NHEERL
Comparing AWQC to Site-Specific Ecological Risk Assessment Results at Superfund Sites: Ned Black and Clarence Callahan, Region 9
Dave Mount, ORD/NHEERL

December 7 - *MORNING* 8:30 AM - 12:00 PM

TOXIC CHEMICALS SESSION (CONTINUED)

8:30 - 9:30 Bioaccumulative Chemicals
Phil Cook, ORD/NHEERL

9:30 - 9:45 BREAK

9:45 - 11:00 Assessing Risks to Wildlife
Basic issues with wildlife criteria: Rick Bennett ORD/NHEERL
Regional Case Study: New Jersey Wildlife Criteria: Wayne Jackson and Dana Thomas, Region 2; Dan Russell, USFWS
Future directions of wildlife criteria for mercury: Rick Bennett ORD/NHEERL

11: 00 - 12:00 MEETING WRAP-UP
Chairs of all sessions: Cirone, Spehar, Macchio, Bennett, Cormier, Welker

Appendix B: List of Participants

Last Name	First Name	Affiliation	Telephone	
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Appendix C: Slides from Presentations and Poster Session

These slides can be found at
http://intranet.epa.gov/ospintra/regsci/aquatic.htm

PLENARY SESSION: OVERVIEW OF AQUATIC LIFE CRITERIA

1.	*Region/ORD Aquatic Life Criteria Workshop - Welcome*	**William H. Farland**
2.	*Toxic Chemicals: Programmatic Overview of Science*	**Charles Delos**
3.	*Water Quality Toxics: Short- and Long-Term Needs*	**Debra L. Denton**
4.	*Impaired Habitat: A Water Program Retrospective/Perspective*	**Douglas J. Norton**
5.	*Strengthening the Use of Aquatic Habitat Indicators in the Clean Water Act*	**Steve Bauer**
6.	*The ORD/NHEERL Approach to Habitat Alteration Research*	**James H. Power**
7.	*Suspended and Embedded Sediments: Status Report and Update from the Office of Water*	**Susan K. Jackson**
8.	*Suspended Solids and Sediments Risk Management Research*	**Christopher T. Nietch et al.**
9.	*USEPA National Nutrient Criteria Program Approach to Reference Condition Development* (not available)	**George Gibson**
10.	*Nutrient Criteria: Challenges Facing Regions and States*	**Danielle Tillman**
11.	*National Framework for Tiered Aquatic Life Uses in State and Tribal Water Quality Standards - Update on Guidance Development*	**Susan K. Jackson**
12.	*Biological Assessments in Region 10 - Approaches, Application and Research Needs*	**Gretchen Hayslip**

BIOCRITERIA AND NUTRIENTS SESSION

1.	*Establishing Multi-Use Reference Sites for Biological & Nutrient Criteria Development*	**Don Huggins**
2.	*Reference Condition for Biological Integrity*	**Phil Larsen**
3.	*The Use of Reference Condition in Support of Surface Water Assessments and Criteria Development in Ohio*	**Chris O. Yoder**
4.	*Use of Reference Sites and Conditions in the Development of Nutrient Criteria* (not available)	**George Gibson**
5.	*Developing Nutrient Criteria Using Multi-Metric Indices: A Case Study in the Mid-Atlantic*	**John Hutchens**
6.	*NHEERL National Nutrients Research Implementation Plan*	**Emile Lores**
7.	*Aquatic Life Use (ALUS) Concept of Reference Sites*	**Susan K. Jackson**

BREAKOUT SESSION I: Multi-Use Reference Sites

1.	*Progress on Development of Reference Conditions & Site Selection Guidelines for Streams*	**Don Huggins**

BREAKOUT SESSION II: Charting a Statistical Course for Navigating the Waters of Bioindicator Development

1.	*Overview*	**Susan Cormier**
2.	*Multimetric Biological Index Development*	**Jeroen Gerritsen**
3.	*Case Study: Developing a Multimetric Index for Wyoming*	**Jeroen Gerritsen**
4.	*Predictive Models in Bioassessment: RIVPACS and beyond*	**Michael Paul**
5.	*Predictive Models: Hands On*	**Michael Paul**

6. *Discriminant Function Models: Utility in Biocriteria Development* **Michael Paul**

7. *Discriminant Function Models in Biocriteria - Hands On* **Michael Paul**

BREAKOUT SESSION III: Aquatic Life Use Support (ALUS)

1. *The Biological Condition Gradient* **Susan P. Davies**

2. *Progression of Ecological Degradation in Mid-Atlantic Streams* **Lester Yuan and Susan Norton**

3. *Numeric Biocriteria [State of Oregon Department of Environmental Quality]* **Rick Hafele**

4. *[Idaho Stream Classification Compared to ALUS]* (not available) **Cyndi Grafe**

TOXIC CHEMICALS SESSION

1. *Risk-Based Criteria* **Russ Erickson**

2. *Discussion of Proposed Guidelines Revisions* **Charles Delos**

3. *ESA Consultation on Toxic Pollutant Criteria* **K. M. Kubena**

4. *Data Quality, New Information, and Interagency Research Coordination* **Chris Tatara and Tracy Collier**

5. *Emerging ESA Issues* **Steven Schwarzbach**

6. *Surrogate Species in Assessing Contaminant Risk for Endangered Fishes* **Foster Mayer**

7. *Predicting the Toxicity of Metals to Aquatic Organisms: The Biotic Ligand Model* **Charles Delos**

8. *Dietary Metals: How Important Are They?* **Russ Erickson**

9. *Numerical ($_{Criteria}$) for Sediment-Associated Chemicals* **David R. Mount**

10.	*Comparing WQC to Site-Specific Ecological Risk Assessment Results at R9 $fund Sites*	**Ned Black and Clarence Callahan**
11.	*Persistent Bioaccumulative Toxicants*	**Philip M. Cook**
12.	*Toxic Chemicals Session: Assessing Risks to Wildlife*	**Rick Bennett**
13.	*Derivation of New Jersey-Specific Wildlife Values as Surface Water Quality Criteria for: PCBs, DDT, and Mercury*	**Dana Thomas and Dan Russell**
14.	*NHEERL Wildlife Research Demonstration Project: Methods to Assess Risks to Piscivorous Bird Populations*	**Rick Bennett**

POSTER PRESENTATIONS AND MODEL DEMONSTRATIONS:

These slides can be found at
http://intranet.epa.gov/ospintra/regsci/aquatic.htm

1. Ankley, G.T., M.D. Kahl, K.M. Jensen, J.J. Korte, E.A. Makynen, and J.E. Tietge. 2001. The Effects of Methoxychlor and Methyltestosterone on Reproduction in a Short-Term Assay using the Fathead Minnow *(Pimephales promelas)*. ***Society of Toxicology Annual Meeting, San Francisco, CA, March 25-29, 2001.*** (ORD/NHEERL)

2. Cook, P.M. MED Contaminated Sediment Research: Assessing Ecological Effects - Persistent Bioaccumulative Toxicants. (ORD/NHEERL)

3. Davoli, D. and P. Cirone. Assessment of Chemicals in Columbia River Basin Fish. (Region 10) (not available)

4. DeFoe, D.L., K.M. Jensen, S.A. Diamond, and G.T. Ankley. 2001. Characterization of Relative Sensitivity of Amphibians to Ultraviolet Radiation. ***Society of Environmental Toxicology and Chemistry Annual Meeting, Baltimore, MD, November 11-15, 2001.*** (ORD/NHEERL)

5. Diamond, S.A., G.S. Peterson, G.T. Ankley, and J.E. Tietge. 2001. Evaluation of UV Radiation Dose in Northern Minnesota Wetlands. ***Society of Environmental Toxicology and Chemistry Annual Meeting, Baltimore, MD, November 11-15, 2001.*** (ORD/NHEERL)

6. Duncan, B. and M.S. Greenberg. Incorporating Contaminated Ground Water Discharges into the 'Traditional' Ecological Risk Assessment Approach. (Region 10) (not available)

7. Henry, T. R., J. Denny and P. Schmieder. Relative Binding Affinity of Alkylphenols to Rainbow Trout Estrogen Receptor. (ORD/NHEERL) (not available)

8. Henry, T.R., M.W. Hornung, J.S. Denny, M. Tapper, B.R. Sheedy, and P.K. Schmieder. An *in vitro* Approach for Screening for Environmental Endocrine Disruptors in Rainbow Trout. ***Gordon Conference on Environmental Endocrine Disruptors, Plymouth, NH, June 2000.*** (ORD/NHEERL)

9. Henry, T.R. Fish Tissue Residue-Based Wildlife Values for Piscivorous Wildlife: Chlordane, DDT, Dieldrin, Endrin, Hexachlorobenzene, Mercury and PCBs. ***American Chemical Society, New Orleans, LA, August 1999.*** (ORD/NHEERL)

10. Henry, T.R., et al. Rainbow Trout *in vivo* Assays for Species Comparisons and SAR Model Development. (ORD/NHEERL)

11. Jensen, K.M., M.D. Kahl, J.J. Korte, E.A. Makynen, M.W. Hornung, and G.T. Ankley. 2001. Evaluation of Fadrozole as an Endocrine Disruptor in Fathead Minnows (*Pimephales promelas*). ***Society of Environmental Toxicology and Chemistry Annual Meeting, Baltimore, MD, November 11-15, 2001.*** (ORD/NHEERL)

12. Johnson, L.L., B.H. Horness, and T.K. Collier. An Analysis in Support of Sediment Quality Thresholds for Polycyclic Aromatic Hydrocarbons (PAHs) to Protect Marine Fish. (NOAA/NMFS) (not available)

13. Kinzinger, B.P., C.L. Russom, D. Grunwald, C. Kowalczak, A. Pilli, and C. Podeszwa. 2001. Evaluation of Literature Establishing Screening Levels for Terrestrial Plants/Invertebrates. ***Society of Environmental Toxicology and Chemistry Annual Meeting, Baltimore, MD, November 11-15, 2001.*** (ORD/NHEERL)

14. Lawonn, M., I.K. Loeffler, E.A. Andreason, R.E. Peterson, W. Fredenberg, and P.M. Cook. 1998. Early Life Toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and PCB 126 to Bull Trout. ***Society of Environmental Toxicology and Chemistry Annual Meeting, Charlotte, NC, November 15-19, 1998.*** (ORD/NHEERL)

15. Mayer, F. Interspecies Correlation Estimation Software (ICE). (ORD/NHEERL)

16. Mount, D., C. Stephan and R. Erickson. Clark Fork River Risk Assessment. (ORD/NHEERL)

17. Norberg-King, T.J., et al. Results of Applying Toxicity Identification Procedures to Field-Collected Sediments. (ORD/NHEERL) (not available)

18. Russom, C.L. U.S. EPA's ECOTOX Database and Associated Applications. (ORD/NHEERL) (not available)

19. Scholz, N.L., et al. Biochemical and Electrophysiological Measures of Pesticide Neurotoxicity in Pacific Salmon. (not available)

20. Sergeant, A. Planning for Ecological Risk Assessment: Developing Management Objectives. (ORD/NCEA) (not available)

21. Stephan, C. and R. Erickson. Ammonia Water Quality Criteria Update. (ORD/NHEERL)

Appendix D: Flip Chart Notes

Breakout Session I: Multi-Use Reference Sites (Day 2)

Attendees:

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Huggins, Don	(University of Kansas)
McCormick, Frank	(ORD/NERL)
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Smith, Bobbye	(Region 9)
Thompson, Brian	(OW/OST)
Tyler, Patti Lynne	(Region 8)
Vaga, Ralph	(Region 10)
Welker, Gary	(Region 7)

Goals / Objectives:

- Develop a working definition of "multi-use" reference site for wadable streams.
- Identify core factors that should be considered when selecting multi-use reference sites for wadable streams.
- Arrive at a group consensus on the definition of each core factor for the selection of multi-use reference sites.

Ground Rules

- Let everyone speak
- No interruptions

Selection of Multi-use Reference Sites for Wadeable Streams

Reference Condition

- Some portion (value, statistic)
  - Cumulative distribution of variables (parameters) from reference sites.
- Reference site vs. reference condition

- Multi-use?
- Beneficial use?
- Based on outcome?
- Designated use ?

Multi-use

- For many parameters
- Scientific
  - Attainable vs. designated

Reference sites

Benchmark to measure the condition of wadeable streams

Order ? 1, 2, 3

- Systematizing
- A subset of population
- What is "good?"
- Common physical characteristic
- Want to classify based on what reference site is vs. is not
- Place in time represents least (minimally) impacted
- How to address human impact (managed)
- Loss of certain ecosystem values, yet "functional"

Multi-use

- Multiparameter
- Best attainable for some function
- ID physical, chemical, biological parameters that define some condition / function
- Minimal landscape disturbance
- "Condition" = state + parameter-specific
- Features used to pick reference sites → data → population of values ≡ reference condition
- Find "sites" - read just once data is taken
- Characteristics / rules
  - Certain gradient
  - "Natural" vegetation
  - ± Feet from bank
- Clear that reference condition ≠ pristine
- No NIS [Non-Indigenous Species]
- ↓ Management
- ↑ h [historical?] system function

- Identify parameters first?
- "Function" of reference condition ≠ BPJ [Best Professional Judgement]
- Least disturbed vs. attainable - impact on cleanup in $F [Superfund]
  - Background vs. attainable
- Why can't I.D. the lower limit? - restoration vs. what will you settle for?
- From scientific standpoint vs. management strategy
- How to classify vs. reference site
  - ?urban "reference" stream
- Keep bar in place / put resources where things can be "fixed"
- Address urban streams thru UAA [Use Attainability Analysis] – public process
  Biotic integrity gradient
- Slopes from minimally to least impacted (top to bottom)
- "Best attainable" based on class
- Integrity ≡ Nutrients

Operational Definition of Reference Sites

- Multipurpose site
- Location in time that represents natural [least (minimally - not significant difference from historic condition) impacted] conditions
- Natural [close to historic] ≡ minimally impacted
- Natural ≅ historic > minimally impacted
- [Also], a location that is representative of the "natural" (minimally impacted by human activities; multipurpose) condition
- A reference site is "absolute value"
- Sufficiently robust to address multiple resource management objectives

Core Factors for Wadable Streams

- No point sources
  - "Definable" level of impacts
- Physical structure - hydrogeomorphology
- Primary productivity
- Minimal anthropogenic impacts
- Chemical parameters
- Biological parameters
  - Including "habitat structure"
- Faunal assemblage ≡ biotic assemblage
  - No exotic, introduced biota
- No alteration
- No altered hydrology (hydrologic regime)
- No non-indigenous species (channel as well as watershed)
  - Natural communities [no manipulation / stocking]

- No human impact on embankment
- Biotic assemblage
- WWTP [Wastewater Treatment Plant] ≡ non-point sources
- Biotic diversity and biomass
  - No non-indigenous species! - No measurable effects [of exotics]
  - Species composition
  - Species diversity
  - Trophic structure
  - Biomass
  - Departure from native assemblage
  - Presence of sensitive species
- Ground truth → implementation
- Developing a process / procedure - iterative
- How to deal with "least / minimally" impacted (don't have "reference" sites)
  - Rank, score, index ≡ quantify (the "best")
- Not sure yet about defined process for implementation
  - Use of historic data at landscape level can give "relative" answer
  - Ambient ≡ reference for R-7
  - No reconstruction of historic, but ↑ function of current system

<u>Two Issues</u>

- Definitions can → hypothesis testing
- "Good," but "not enough"
- TMDL [Total Maximum Daily Load] interplay (DO [Dissolved Oxygen] / nutrients)
- What resources will be needed? ↑↑$, will it go to finding the sites or sampling?
- Kansas - 60 years, now no high plains streams - but may use other states' reference sites
- Method comparability
  - Performance criteria
  - DQOs [Data Quality Objectives]
- EMAP - tool for crossing geopolitical boundaries
  - Translators
- Use reference sites as a way to translate methods
- Science process + "people process"
- RTAGs [Regional Technical Assistance Groups] provide vehicle for cross-communication
- Strawman - approach is attractive
- Neutral party facilitates cross-communication among states, tribes

What Research "Weakness"

- Assumptions behind "random sampling"
  - Resources
  - Use existing state sites
- QA/QC for data sampling
- Refined / practical models for extrapolating
- How many different types of systems are there (stream types, lake types?)
- Bringing people together

Core Factors for Reference Sites

1. Land use / land cover broad-scale
2. Land use / land cover site specific
3. Altered hydrologic regime
4. Biotic diversity and biomass
5. Physical and chemical parameters
6. Representativeness
7. Habitat, instream
8. Habitat, riparian

Breakout Session II: Charting a Statistical Course for Navigating the Waters of Bioindicator Development (Day 2)

Attendees:

Baxter, Jan	**Region 9**
Bennett, Rick	**ORD/NHEERL**
Borst, Mike	ORD/NRMRL
Cormier, Susan	ORD/NERL
Denton, Debra	Region 9
Dutch, Maggie	Washington State Department of Ecology
Gabanski, Laura	OW/OWOW
Gerritsen, Jeroen	Tetra Tech, Inc.
Hammer, Ed	Region 5
Hillger, Robert	**Region 1**
Hutchens, John	ORD/NERL
Johnson, Mike	University of California - Davis
Kravitz, Michael	ORD/NCEA
Laidlaw, Tina	Region 8
Larsen, Phil	ORD/NERL
Moerke, Ashley	Region 5
Nietch, Chris	ORD/NRMRL
Norton, Doug	OW/OWOW
Paul, Michael	Tetra Tech, Inc.
Pfeifer, Dave	Region 5
Yoder, Chris	Midwest Biodiversity Institute
Zumberger, Jeremy	Wyoming Department of Environmental Quality

* Names in bold were listed on the preliminary sign-up sheet, but not on the actual sign-in sheet.

1. What dimension of integrity do we capture?

2. Which stressors do metrics respond to?

3. Guidance of frequency and magnitude of response / score for decisions

4. Strengths and limitations of methods

5. Statistical basis of decision

6. Keep conceptual thread throughout:
   - Explain conceptual background up-front
   - Conceptual lead in each mathematical section

Breakout Session III: Aquatic Life Use Support (Day 2)

Attendees:

Arena, Sandra	U.S. Fish and Wildlife Service
Bauer, Steve	Pocket Water, Inc.
Beckwith, Bill	Region 1
Black, Ned	Region 9
Borsuk, Frank	Region 3
Burch, Susan	U.S. Fish and Wildlife Service
Cirone, Patricia	Region 10
Crisp, Terri	Region 6
Davies, Susan	Maine Department of Environmental Protection
Delos, Charles	OW/OST
Fujii, Laura	Region 9
Grafe, Cyndi	Idaho Department of Environmental Quality
Hafele, Rick	Oregon Department of Environmental Quality
Hayslip, Gretchen	Region 10
Jackson, Susan	OW/OST
Leinenbach, Peter	Region 10
Lores, Emile	ORD/NHEERL
Macchio, Lisa	Region 10
Mayer, Foster	ORD/NHEERL
Narvaez, Madonna	Region 10
Noble, Sandra	U.S. Fish and Wildlife Service
Norton, Susan	ORD/NCEA
Pimentel, Theresa	Region 10
Plotnikoff, Rob	Washington State Department of Ecology
Power, Jim	ORD/NHEERL
Russell, Dan	U.S. Fish and Wildlife Service
Spehar, Bob	ORD/NHEERL
Tillman, Danielle	Region 5
Yuan, Lester	ORD/NCEA

Objectives:

- Road test draft biological condition gradient.
- Scientific issues and research questions – technical assistance and research plans (ORD participants).
- Program implementation and communication (water program coordinators).

State Standards:

- Applicability of draft model to existing state use classifications.
- All three states (Oregon, Idaho, Washington) – applicable to scientific / ecological tiers.

Note: States may not have sufficient database to distinguish six (6) tiers – Idaho (currently) has three (3) tiers. Framework works at this level of resolution.

Implementation Issue:

- Concern regarding rule-making process to refine uses.
- States propose options: to incorporate conceptual model into existing standards construct through reference to a process (Idaho), or methods of interpretation and quantification of current use classes (Oregon).
- Washington: potential implementation along lines of Oregon approach.

Session outcome:

- Headquarters and regions collaborate with states to work through implementation options; determine if valid and identify benefits (added value) to states.

Most frequently asked questions:

1. Linkage with aquatic life water quality criteria?

2. Result in downgrades? (303d listing)

3. How does this relate to Endangered Species Act?

4. How does this concept / model help?

5. How can this be implemented in different programs?

6. What will this concept / model look like in permit?

ORD: Opportunities for collaboration and research needs:

1. More stressor-response in context of tier use (more regions, types of stressors, habitat / sediment-related variables).

   Important: Strengthen threshold establishment.

2. Linkage with nutrients – collaboration opportunity: Skeets Lores / estuaries food web indicator.

3. Alternate ways to reference condition.

4. Tiers and applications in TMDL model – Restoration Goals.

5. Potential collaboration – Superfund, Ned Black / Mila Kravitz.

6. Restoration tools – evaluating effectiveness in achieving biological targets (e.g. shared objective with Fisheries and Wildlife regarding focus on enhancing recovery of species).

Issues brought up during introduction / "around the room"

- More technical underpinnings of ALUS
- Nightmares for permits?
- Biocriteria usage in states
- ALUS: revisions of Washington State criteria ↑ biomonitoring role
- Oregon's biocriteria and beneficial uses standards and permits
- Linking ALUS with AWQC [Ambient Water Quality Criteria]
- Describe communities associated with particular use designations – get a picture
- Advances in framework – applications to wetlands?
- Nutrient – Food web – Criteria: better linking with states
- Linkage with Ecorisk – broaden beyond tox [toxics]
- Moving to implementation concerns regarding downgrading quality, independent applicability
- Concerns on misuse of beneficial uses: listed species, ESA [Endangered Species Act] linkages
- Use Attainability Analysis (UAA) as a means to downgrade
- Incentives to upgrade – carrot
- Can TMDL [Total Maximum Daily Loads] accommodate a sliding scale?
- Changing target complicates modeling for TMDLs
- How do you derive numerical standards – ESA issues
- Linking tiers with indices:
  - Use to develop anti-degradation
  - Implications for large rivers

  - Concerns over moving "least impaired"
  - Obstacles to upgrading
- Improve research directions
- How to apply framework to reviews of standards, frameworks of other agencies

Comments / Questions on Davies

- Historically documented taxa: what is the time point? (1975? Clean Water Act?)
- Make it consistent with existing uses, non degradation
- Distinguish 1975 time point from good reference condition
- Do you "OR" attributes together?
- Distinguish "rare" from threatened and endangered species
- Circularity between how valued a species is and degree of human influence; more valued species defined as sensitive to human influence
- Headwater streams normally have tolerant species
- Ecosystem function – elaborate
- Numbering attributes implies an order - confusing with tiers
- Linkage to Clean Water Act goals?
- What scale? (Spatial)
- Implications for chemical targets: can states do both biomonitoring and chemical [monitoring]?
- Emphasize role of independent app. [applications?] up front

Yuan (questions / comments)

- Combining across assemblages
- Demonstrate method across other regions
- WV [West Virginia] data set
- Where do tiers 1 and 2 fit on pH diagram?
- Might be used to regionally modify national criteria
- May want to have different AWQC for different tiers
- Data driven – might be able to distinguish additional categories
- Difference between designated uses and aquatic life uses and condition
- Moving from condition to uses can take a lot of time
- Connection with volunteer monitoring
- Degree of sophistication needed to implement tiers
- Unassessed waters – more lawsuits

Toxic Chemicals Session (Day 3)

Toxicity data

- Problems
- Any support to collect / do new toxicity data / tests
- Lab is not in the position currently to do this
- Limitations with toxicity data – what can be done about this?
- Is there something that can be done generically with the data?

Cumulative action

- Conceptually can be done
- Can be accomplished with models

Implementation

- Permitting: process would need to change
- Need site-characteristic inputs; could be a software tool

Chronic

- Taking the model and applying it to chronic
- Has not been worked out
- Probably could be – modeling approaches

ACR: We want to get away from these

Bioaccumulative / ESA

- Can you adjust the model to incorporate these issues?
- Same tools can be applied
- Problem formulation – adjusted

Monitoring in an ambient sense?

- Has this been considered with the model?
- It could be more specific method to determine compliance
- It would make compliance monitoring more meaningful

Endpoints

- How can this be handled?
- Data-poor

Landscape matters

- Connectivity / Spatial matters
- An issue – immigration rate?

Communities

- Were not thought about when developed

How does it handle rare species?

- Not a model for T&E [threatened & endangered] species
- If immigration low or not happening this is problematic in this model / framework

Community interactions

- Prey shifts
- Complex
- Was viewed as a national scheme
- EPA backed off from this somewhat – viewed as too risky
- Protection at the organism level?
- ESA methodology consultation stressed
- Natural life history of communities / species may be a portal
- Methodology: we need to agree at the methodology level – ESA, CWA

Support for this framework / model

- No resources
- ORD needs to assign resources
- Management support is there
- Fewer research for toxic chemicals
- Perhaps not a large leap to get to the next phase; could incorporate other issues in the model
- Testing of key indicator species

Needs / Challenge

- We have the needs now: short-term and long-term
- Deb Denton
- How do we handle the needs now?

ESA NEEDS

- Methylation rates – did not do it, but is going to be done by CALFED. Did look at methylation in sediments.

- Adequacy of current methodologies:
  - LC_{50}s cannot protect adequately
  - Effects level / endpoint – shouldn't assume not protective?

- Observable effects / expected in the field; salmon return data was valuable, maybe / maybe not a good place to be

- Research agenda:
  - Good train of evidence to link
  - Connectivity is important
  - Lines of evidence: share data

- What is more important or bigger issue? Fish tissue number, human health-based criteria, or wildlife value?

- Can we try to work together prior to publishing data:
  - Across Agency
  - NMFS [National Marine Fisheries Service] Science Center / ORD
  - Who is the contact within each agency?

- [Section] 7(a)(1) Consultation – proactive approach:
  - Gets to the process
  - Steps down to the field level
  - Pesticide / Water Quality criteria consultation
  - How to crosswalk these two – two programs
- PCB issue:
  - Mixture vs. purified form
  - Early life stage for salmonids
  - Temperature / pH influences
  - Sonny's model does not address the PCB issue
  - Embryo / larval salmonids – sensitivity not constant

- Correlation between some species; seems to be a taxonomic effect.
- Hardness slope: is it different for different species?

Planning process in EPA:

- SPRC
  - Strategic Planning and Research Coordination
  - ORD/OW Coordination
  - Contact: Mary Reiley, HQ
    Laura Gabanski, HQ/OW/OWOW

- Aquatic Stressors
  - ORD/NHEERL Research Plan
  - Contact: Bob Spehar, ORD/NHEERL

- EPA Research Coordination Teams
  - Rank research annually
  - Regional input
  - Contact: Pat Cirone, Dick Garnas, EPA Region 10

- Multi-Year Plan (ORD)
  - Goal 2 – Water: Lee Mulkey
  - Goal 8 – Multimedia: Tom Barnwell
  - Regional input
  - Contact: Same as above

Relationship

- Assumption: the closer the relationship taxonomically, the closer the relationship of toxicity is, whether or not endangered
- Endangered species did not become endangered due to toxic chemicals
- Are threatened / endangered species especially sensitive? Is there any data? (Razorback sucker / selenium)

Genetic Diversity

- Populations → individuals
- Bioavailability a bigger issue than population, individuals
- Exposure to individuals or populations
- Where is the BLM [Bureau of Land Management?]
- Copper is coming – no implementation

Dietary Exposure

- More resolution needed
- Collaboration / resources from all agencies needed
- Linking criteria to community structure endpoints
- Need to work all scales – not just population level

Appendix E: Workshop Participant Evaluation Summary

Most participants found that the workshop gave them a better overall understanding of the issues associated with aquatic life criteria. The responses regarding the most useful topic varied widely, with attendees explaining they were particularly interested in topics related to their own field (e.g., biological metrics to establish criteria, aquatic life, and toxics). In general, the topic found to be least useful was sediment criteria. Topics identified as missing included: wetland and lake efforts, applicability to implementation of aquatic life criteria and other EPA programs (e.g., wildlife criteria, TMDLs, National Pollution Discharge Elimination System), and sediment tools.

The breakout sessions were thought to be a good opportunity to delve deeper into specific topics. Several attendees did caution that there was not enough time to develop meaningful, well-thought-out results. In addition, some participants expressed the desire to spend more time identifying regional and program office needs and the ORD research to address those needs. Attendees found the inclusion of speakers from outside EPA to be valuable, in particular at the state level.

The majority of participants considered the format of the workshop to be a good balance of presentations, discussions, and small group sessions; some, however, thought the time for questions should have been more flexible to accommodate presentations that elicited longer discussions. Attendees thought the posters were effective in presenting information related to the workshop and suggested increasing the diversity of poster presenters and including case studies.

Many participants appreciated the opportunity to establish contacts between ORD and the Regional Offices. Suggestions for continuing this interaction included creating an email listserv, posting meeting presentations and other follow-up material on the EPA intranet, and conducting clinics on short-term needs and issues (e.g., ESA issues). Overall, meeting evaluations reflected the desire for an annual meeting, workshop, or clinic to identify ORD research and tools to meet region and program office needs and how to implement those tools.